NANTICOKE
1988 AIR QUALITY
DATA SUMMARY

SEPTEMBER 1990

Ontario
Environment
Environnement

ISSN 0847-172X

NANTICOKE

1988 AIR QUALITY DATA SUMMARY

Report prepared for:
West Central Region
Ontario Ministry of the Environment

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West Central Region

SEPTEMBER 1990

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PIBS 1250
log 89-4400-008

ABSTRACT

This report summarizes the results of air monitoring in the vicinity of the major industrial complex in the City of Nanticoke in 1988.

The data showed that air quality in the area was usually excellent as most pollutants measured were well below relevant objectives.

Localized problems were related to odours and fugitive dust emissions from Stelco in Nanticoke Village. The Ontario Hydro Generating Station was the cause of short term sulphur dioxide fumigation episodes, but only 4 hours out of almost 80,000 hours of monitoring exceeded the SO_2 hourly objective.

Stelco has taken successful measures to reduce fugitive dust emissions but odorous reduced sulphur emissions need to be greatly reduced. Studies have indicated that slag quenching was the main source of the odours. The company has been requested to submit an Action Plan to address the problem. The plan would include dates by which specific steps will be completed.

A Control Order was issued to Ontario Hydro in 1985 to reduce windblown dust emissions. The control program to date has been successful, evidenced by significant improvements in particulate measurements in 1987 and 1988.

The other major industry in the area, Texaco Canada Inc., showed a mostly negligible impact on air quality.

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INTRODUCTION

The Nanticoke Environmental Management Program (NEMP) was formed in 1978 to co-ordinate a study of the background air quality and subsequent impact of industrial development on air quality in the area surrounding Nanticoke. NEMP was sponsored jointly by the Federal and Ontario Governments, Ontario Hydro, Stelco and Texaco. Beginning in 1984, the West Central Region of the Ontario Ministry of the Environment assumed responsibility for network operations from the Air Resources Branch. At that time, the monitoring network was reduced because air quality was generally good, and intensive monitoring in outlying areas was not warranted.

In mid-1985, NEMP and a similar group concerned with water quality were amalgamated into one organization called the Nanticoke Environmental Committee. All activities are now undertaken under NEC. A private contractor funded by Texaco and Stelco provided one technician to assist in maintaining the air monitoring network.

The purpose of the monitoring program is to determine compliance with provincial air quality criteria and also to measure the impact of the industrial development on the local air quality. Contaminants which may enter the area from outside sources are also identified.

The three main industries which have located in Nanticoke are Ontario Hydro's Thermal Generating Station, Texaco's oil refinery and Stelco's basic steel plant. A few smaller industries have located in the area as well.

NEC has undertaken to measure the ambient air concentrations of those compounds or substances that are regulated under the Provincial and Federal Environmental Protection Acts, and that could be a result of the Nanticoke industries' activities. The Ontario Ministry of the Environment's air quality criteria are set for the protection of human health and well being as well as to protect vegetation, animal life and property.

MONITORING NETWORK

Monitoring stations have been located to take into account predominant wind patterns and source location as well as to try to differentiate between industrial and other contributions.

A map of the 1988 network is shown in Figure 1, and the pollutants measured at each location are given in Table 1. Wind data (speed and direction) were measured at both Long Point and near Jarvis. Figure 2 displays the wind frequency distribution measured at Jarvis. Winds from the southwest sector tend to predominate. The Jarvis station's wind data were utilized in a computer program known as a "pollution rose" which is essentially a cross-tabulation of average hourly pollutant concentrations with wind direction. The pollution roses for individual stations are illustrated graphically on several maps in the report. For each "rose" presented, the length of individual lines drawn is proportional to the average concentration when the wind was blowing from that direction. The data from this program are a useful tool in identifying sources of pollutants.

In addition to the NEMP monitoring network, Ontario Hydro has operated its own network of sulphur dioxide analyzers since 1970. These data are referred to in this report.

FIGURE 1

NANTICOKE AIR MONITORING NETWORK

TABLE 1
MONITORING NETWORK

Map Ref.	Number	Location	SO_2	TSP	CHx	TRS	O_3	NOx	DF	F	Wind/Temp
	22057	Nanticoke Creek								X	
	22070	Nanticoke Village							X		
	22071	Simcoe	X		X		X	X			
	22074	Texaco								X	
	22083	Dogs Nest								X	
	22086	Cheapside	X			X		X			
	22087	Jarvis		X							
	22090	Port Dover		X							
	22092	Rainham/Sandusk		X					X		
0	22093	N.G.S. Flyash Area							X		
1	22094	Townsend	X								
2	22901	Long Point	X				X	X			X

SO_2 - sulphur dioxide
TSP - total suspended particulate
CHx - hydrocarbons
TRS - total reduced sulphur
O_3 - ozone
NOx - oxides of nitrogen
DF - dustfall
F - fluoride

TABLE 1 (continued)
MONITORING NETWORK

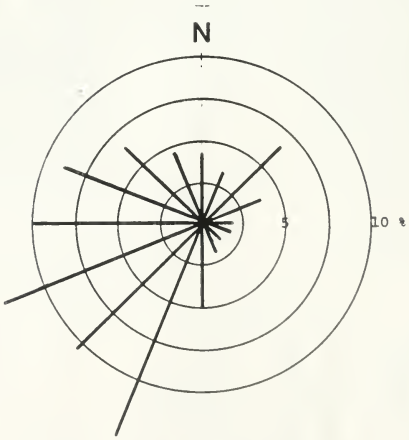
Map Ref.	No.	Location	SO_2	TSP	CHx	TRS	O_3	NOx	DF	F	Wind/Temp
13	22904	S. Walpole School	X(O.H.)	X	X	X					
14	22907	Nanticoke Village	X	X	X	X					
15	22961	Nanticoke North		X						X	
16	22964	Stelco North		X							
17	22965	Dogs Nest/Hwy. 6		X							
18	22883	Jarvis Met Tower (Ontario Hydro)									X
19	22911	Balmoral(O.H.)	X								
20	22913	Nanticoke Rd.(O.H.)	X								
21	22914	Sandusk(O.H.)	X								
22	22915	Kohler(O.H.)	X								

SO_2 - sulphur dioxide
TSP - total suspended particulate
CHx - hydrocarbons
TRS - total reduced sulphur
O_3 - ozone
NOx - oxides of nitrogen
DF - dustfall
F - fluoride

FIGURE 2
WIND FREQUENCY DISTRIBUTION

22883 - ONTARIO HYDRO MET. TOWER

JARVIS., 1988



Lines indicate direction from which wind blew

ANALYSIS OF DATA

Sulphur Dioxide

Sulphur dioxide (SO_2) was measured continuously at five sites within the NEC network and at five Ontario Hydro stations in 1988. All of the stations easily met the annual and daily air quality objectives of .02 and .10 ppm respectively. Data from the Ministry monitors are given in Table 2a and data for the Hydro monitors are in Table 2b. Out of a total of about 80,000 hours of monitoring, the 1-hour objective of .25 ppm was exceeded twice at Hydro monitor NNE05-South Walpole School, and once each at Ministry monitor 22071-Simcoe and 22086-Cheapside. Each exceedence was caused by short term fumigations resulting from the Generating Station's plume. Several other similar fumigation incidents were observed at other stations, but these did not exceed the hourly objective.

Pollution roses for SO_2 in Figure 3 for the five Ministry monitors generally showed a measurable long-term impact from the Nanticoke industries as highest averages were generally related to winds from the industrial area. These averages, however, were quite low and well within objectives.

Figure 4 illustrates the historical trend of sulphur dioxide annual average concentrations of six SO_2 monitors which have operated continuously since 1976. Concentrations can be seen to be very uniform over this period with no deterioration in concentrations. Similarly in Figure 5, the number of hourly exceedences per year at these six stations is shown. A decline in the curve is apparent.

TABLE 2a
SULPHUR DIOXIDE
UNITS - PARTS PER MILLION
MINISTRY OF ENVIRONMENT MONITORS

Ontario Objectives: 1-hour - .25
24-hour - .10
1-year - .02

			Annual Average	Maximum 1-hour	Maximum 24-hour	No. of Times Above Objective 1-hour	No. of Times Above Objective 24-hour
22071	Simcoe	1988	.005	.29	.04	1	0
		1987	.003	.10	.02	0	0
		1986	.003	.12	.02	0	0
22086	Cheapside	1988	.006	.36	.04	1	0
		1987	.002	.24	.04	0	0
		1986	.002	.33	.03	2	0
22094	Townsend	1988	.002	.21	.02	0	0
		1987	.002	.19	.03	0	0
		1986	.004	.26	.06	1	0
22901	Long Point	1988	.002	.10	.02	0	0
		1987	.002	.17	.02	0	0
		1986	.002	.07	.03	0	0
22907	Nanticoke Village	1988	.004	.15	.05	0	0
		1987	.003	.14	.04	0	0
		1986	.002	.16	.03	0	0

TABLE 2b
SULPHUR DIOXIDE
UNITS - PARTS PER MILLION
ONTARIO HYDRO MONITORS

Ontario Objectives: 1-hour - .25
24-hour - .10
1-year - .02

		Annual Average	Maximum 1-hour	No. of Times Above Objective 1-hour	24-hour
22911 Balmoral (NNE16)	1988	.004	.22	0	0
	1987	.006	.32	2	0
	1986	.006	.20	0	0
22913 Nanticoke Rd. (NNW08)	1988	.003	.18	0	0
	1987	.005	.21	0	0
	1986	.004	.39	2	0
22914 Sandusk (N07)	1988	.004	.22	0	0
	1987	.005	.23	0	0
	1986	.006	.15	0	0
22915 Kohler (NE19)	1988	.003	.13	0	0
	1987	.004	.09	0	0
	1986	.004	.17	0	0
22916 Walpole South School (NNE05)	1988	.005	.30	2	0
	1987	.006	.25	0	0
	1986	.006	.24	0	0

FIGURE 3

POLLUTION ROSES - 1988

SULPHUR DIOXIDE

FIGURE 4

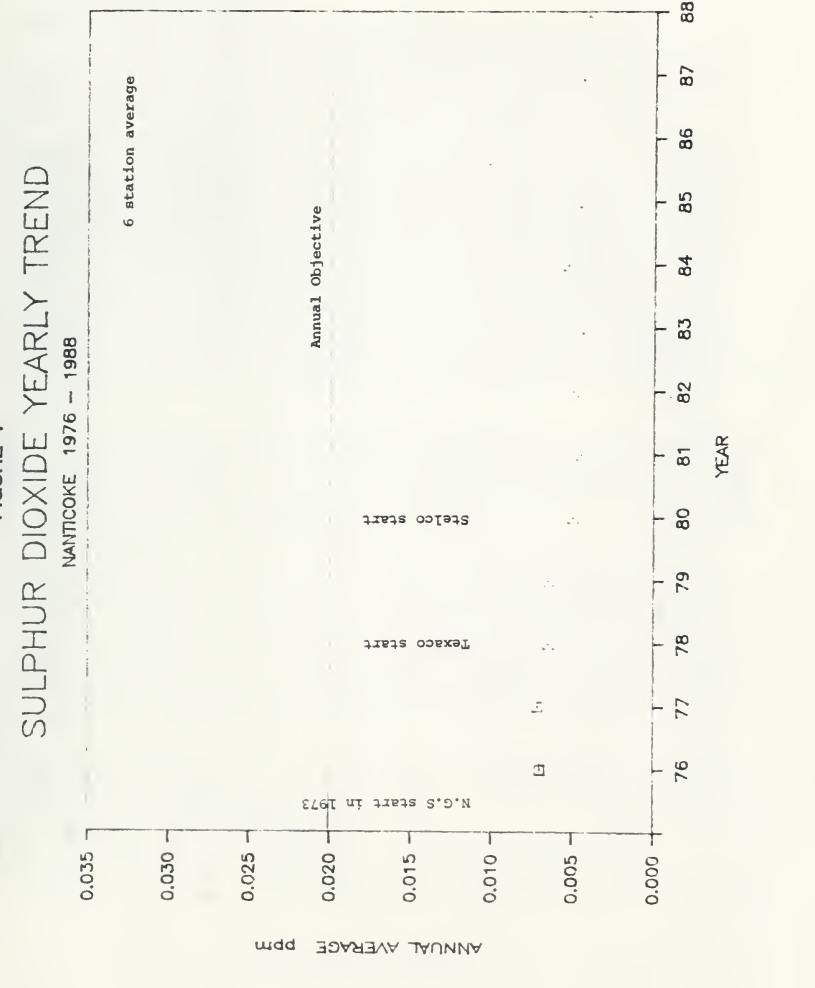
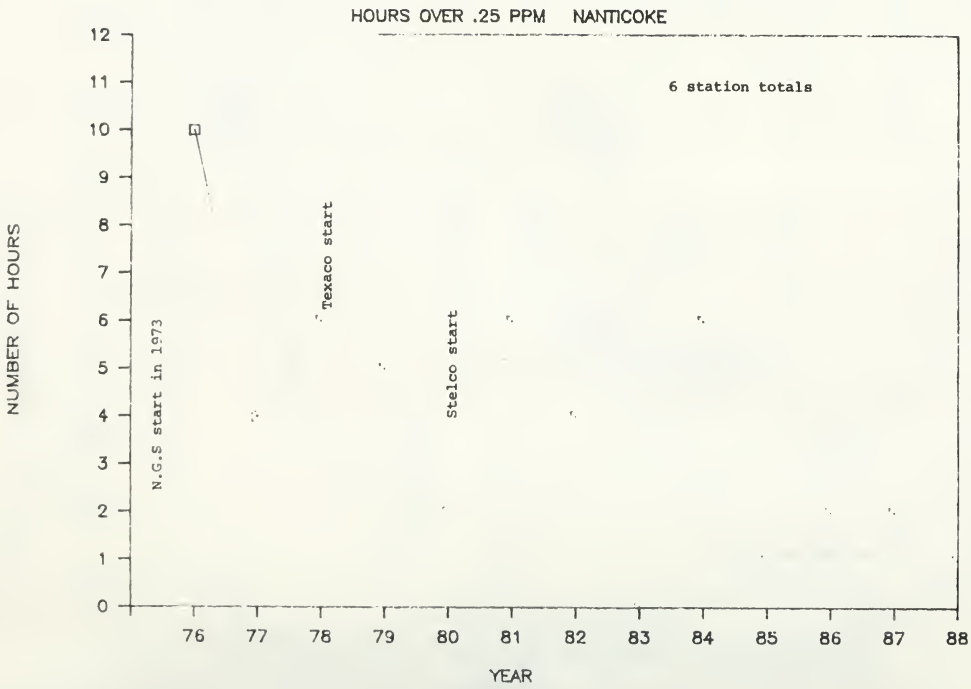

SULPHUR DIOXIDE YEARLY TREND
NANTICOKE 1976 -- 1988
6 station average
Annual Objective
Texaco start
Steico start
N.G.S start in 1973
ANNUAL AVERAGE ppm
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
76
77
78
79
80
81
82
83
84
85
86
87
88
YEAR

FIGURE 5

SULPHUR DIOXIDE EXCEEDENCE TREND



Total Reduced Sulphur

Total Reduced Sulphur (TRS) was monitored at three locations - in Nanticoke Village, at South Walpole School on Sandusk Rd. and on Cheapside Rd. just south of Highway 3. There are no general criteria for TRS but there is an hourly objective for hydrogen sulphide (H_2S), the "rotten egg" gas, of 20 ppb. The monitoring instrument measures H_2S, and many other sulphur compounds.

Sources of these pollutants include slag quenching activities and the coke ovens/by-products plant at Stelco and fuel oil storage tanks and a sulphur recovery operation at Texaco. Apart from industrial sources, sulphur compounds can be liberated from groundwaters that have been contaminated by natural seepages or from leaking natural gas wells, known to exist in the area. Stelco sulphide emissions have been shown to consist primarily of H_2S and thus, comparison of TRS data to the H_2S objective, particularly within Nanticoke Village when downwind of Stelco, is reasonable. Texaco emissions have been less well characterized but are not believed to consist primarily of H_2S. Other organic sulphur compounds are probably present in their emissions and consequently levels downwind of Texaco cannot be rightfully compared to the H_2S standard. The TRS data are summarized in Table 3.

In 1988, TRS levels remained very low at the South Walpole School and Cheapside stations. Nanticoke Village worsened from 1987 and showed the highest levels. Yearly trends are illustrated for each station in Figure 6. The data is the number of hours exceeding an arbitrary flag concentration of 10 ppb which is the approximate odour threshold for H_2S.

The Cheapside station recorded only 2 hours above this concentration in 1988, one of which was above the hourly H_2S objective (20 ppb) as given in Table 3. The South Walpole School monitor recorded 10 hours above 10 ppb of which one was above 20 ppb (out of over 8,400 hourly readings), both similar to previous years. Except for one case, all of these concentrations coincided with equally high or higher levels measured at the Nanticoke Village Station. This, together with the southwest wind conditions, implies that Stelco, not Texaco may have been the source of the elevated levels measured at the school.

Levels recorded in Nanticoke Village close to Stelco were much higher on average. There were 176 hours above the flag concentration of 10 ppb here and the hourly H_2S objective (20 ppb) was exceeded during 28 hours during the year. This was another increase from previous years.

The pollution rose in Figure 7 for Nanticoke Village shows a very strong TRS impact from Stelco. The roses for the Cheapside and school sites show only minor industrial impact.

As shown in Figure 6, higher concentrations in Nanticoke Village TRS are plainly evident since 1982. Discussions with Stelco have been undertaken in order to identify and reduce TRS emissions. The company lengthened their slag quenching pit in 1987, which served to increase the surface area of slag allowing for more air cooling, thus lessening quench emissions. However, this measure has been unsuccessful in improving air quality. In August, 1988, Stelco shut down their blast furnace for a major reline. This eliminated all slag quenching. During this time, there were no elevated TRS concentrations measured in Nanticoke Village. This suggests that slag quenching is the main source affecting TRS levels. There is one other potential source of TRS at Stelco - the coke ovens/by-products plant. A special survey with a fixed TRS sampler between the two sources on Stelco property was run from August to November. It showed that both sources were capable of discharging very odourous TRS concentrations. However, since the coke ovens ran normally during the blast furnace reline, the absence of elevated TRS in Nanticoke Village during that time indicates that coke oven emissions do not extend that far. Stelco has been requested to submit an Action Plan to address their TRS emissions. Included would be dates by which specific steps will be completed.

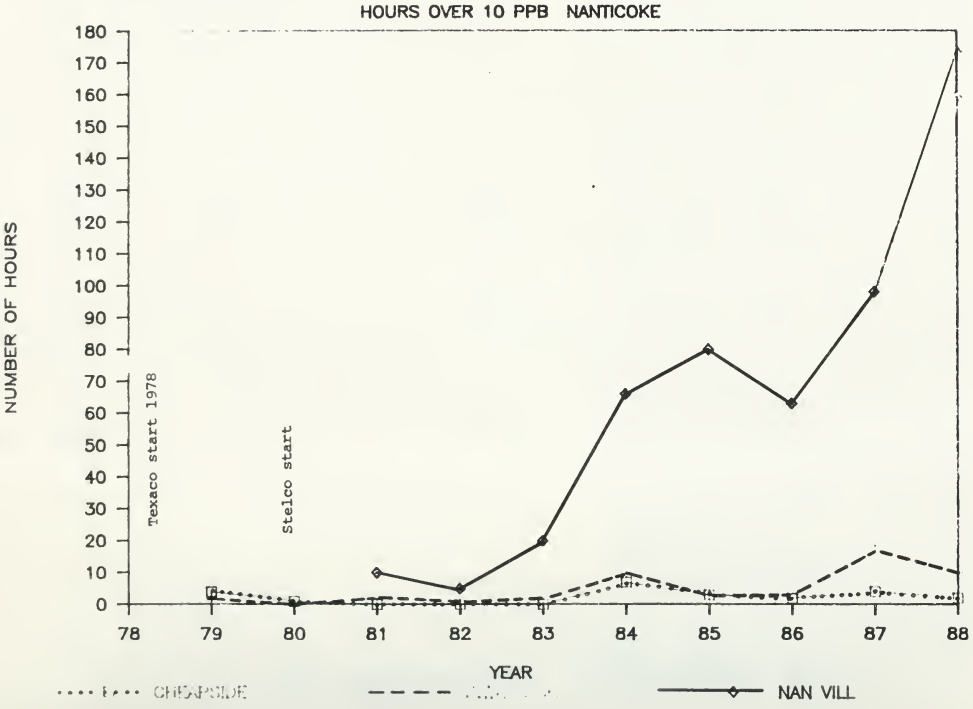
TABLE 3
TOTAL REDUCED SULPHUR
UNITS - PARTS PER BILLION

Ontario Objective: 1-hour -20
(Hydrogen Sulphide)

			Annual Average	Maximum 1-hour	No. of Hours Above	
					20 ppb	10 ppb
22086	Cheapside	1988	.5	22	1	2
		1987	.2	17	0	4
		1986	.4	14	0	2
22904	South Walpole School	1988	.4	22	1	10
		1987	.2	28	5	16
		1986	.1	13	0	3
22907	Nanticoke Village	1988	1.3	98	28	176
		1987	1.3	55	29	100
		1986	.8	51	19	63

FIGURE 6

TOTAL REDUCED SULPHUR EXCEEDENCE TREND



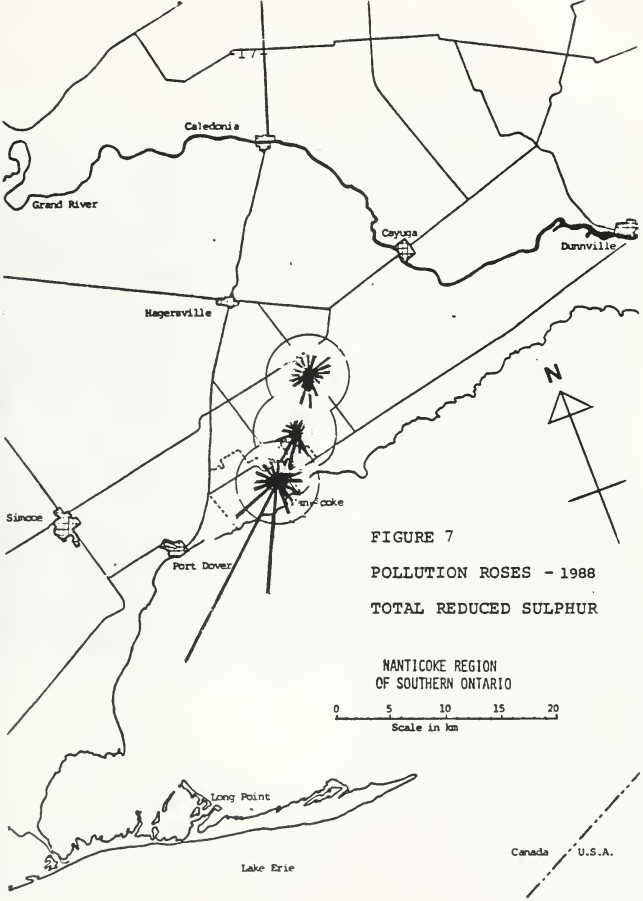


FIGURE 7

POLLUTION ROSES - 1988

TOTAL REDUCED SULPHUR

NANTICOKE REGION
OF SOUTHERN ONTARIO

Scale : ppb

0 1

Oxides of Nitrogen

Oxides of nitrogen result from high temperature combustion sources including the automobile. The most abundant oxides are nitric oxide (NO) which is largely a direct emission of fuel burning and nitrogen dioxide (NO_2) which is mostly an oxidation product once the contaminant is airborne. Objectives exist only for nitrogen dioxide and are based on odour threshold levels (hourly-.2 ppm) and health effects (24-hour-.1 ppm). Other adverse effects occurring at higher levels include vegetation damage, reduced visibility and corrosion of metals.

Data for NO_2 and NO for three stations are summarized in Tables 4 and 5. Levels in 1988 continued to be very low and well within objectives. There have never been any NO_2 exceedences measured. The pollution roses for NO_2 in Figure 8 indicate little contribution from the Nanticoke industries. Road traffic is likely as much a factor as industrial emissions.

Yearly trends of NO_2 for the three stations are given in Figure 9. In the past few years a trend to decreasing concentrations is apparent although an increase occurred in 1988. This change may have been related to the installation of a new provincial telemetry system in June, 1988. Different rounding protocols in the new system may have introduced a slight bias in the data. On the other hand, data in Table 5 show a decrease in the NO averages in 1988, the reason for which is unclear, except that variations in long-term averages of low level concentrations may be simply due to statistical randomness. Figure 10 depicts annual NO trends for the three stations and displays unstable averages exhibiting no real trend. Instrument performance was probably a factor in the instability.

TABLE 4
NITROGEN DIOXIDE
UNITS - PARTS PER MILLION

Objectives: 1-hour - .20
24-hour - .10

		Annual Average	Maximum 1-hour	Maximum 24-hour	No. of Times Above Objective 1-hour	No. of Times Above Objective 24 hour
22071 Simcoe	1988	.008	.06	.03	0	0
	1987	.005	.08	.02	0	0
	1986	.005	.09	.04	0	0
22086 Cheapside	1988	.007	.07	.03	0	0
	1987	.002	.03	.02	0	0
	1986	.005	.07	.03	0	0
22901 Long Point	1988	.011	.05	.04	0	0
	1987	.008	.06	.04	0	0
	1986	.007	.06	.03	0	0

TABLE 5
NITRIC OXIDE
UNITS - PARTS PER MILLION

		Annual Average	Maximum 1-hour	Maximum 24-hour
22071 Simcoe	1988	.002	.08	.02
	1987	.005	.04	.01
	1986	.007	.10	.03
22086 Cheapside	1988	.003	.21	.03
	1987	.008	.10	.04
	1986	.001	.13	.02
22901 Long Point	1988	.001	.07	.04
	1987	.003	.06	.03
	1986	.000	.04	.02

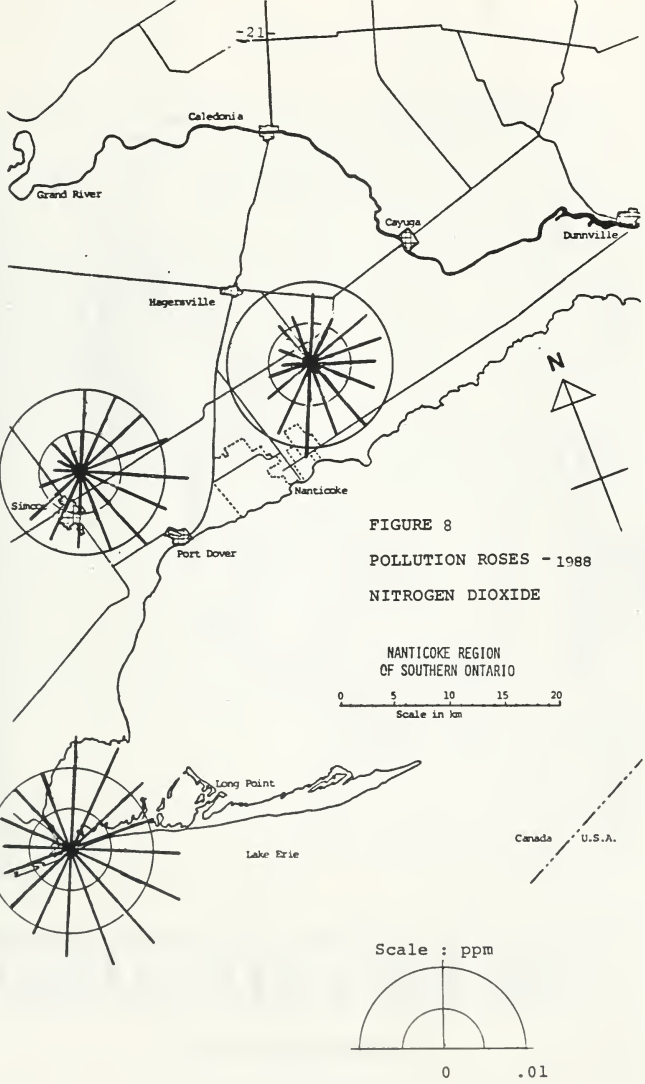


FIGURE 8

POLLUTION ROSES - 1988

NITROGEN DIOXIDE

NANTICOKE REGION
OF SOUTHERN ONTARIO

0 5 10 15 20
Scale in km

FIGURE 9

NITROGEN DIOXIDE YEARLY TREND

NANTICOKE 1976 – 1988

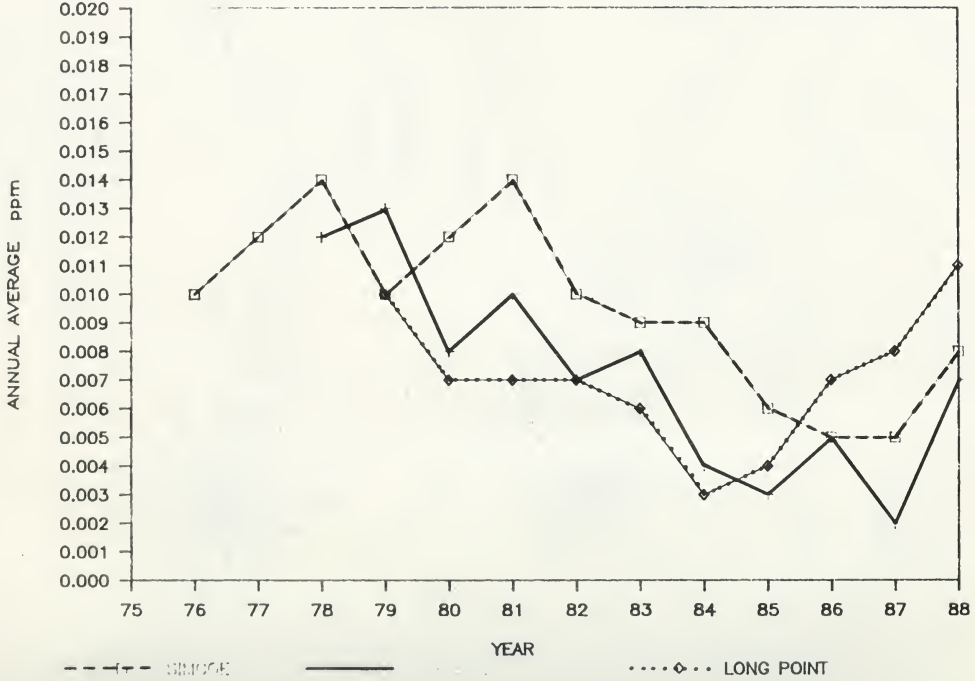
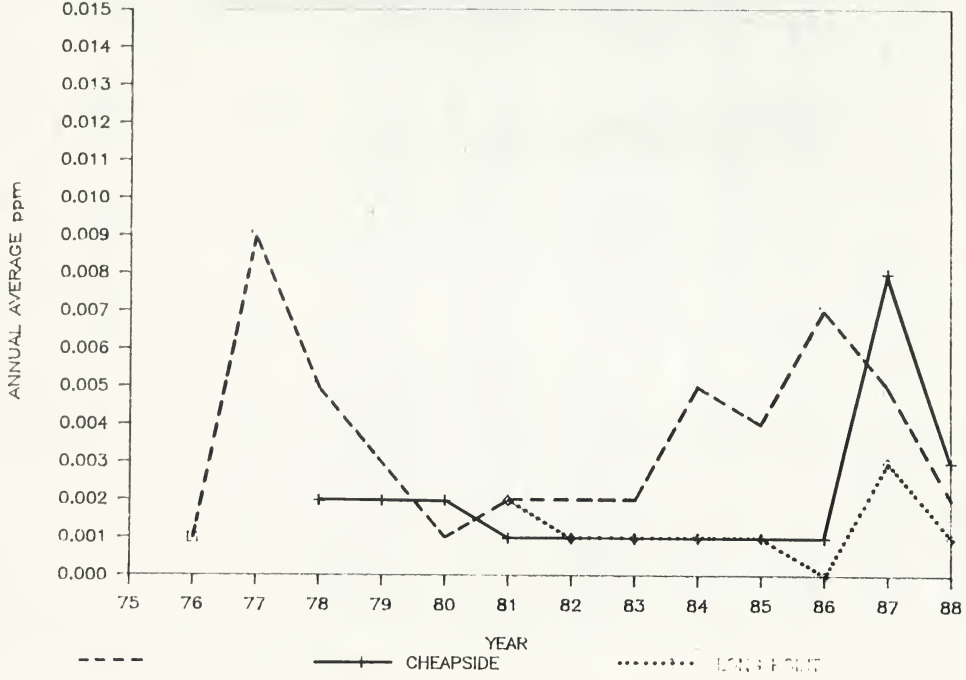


FIGURE 10

NITRIC OXIDE YEARLY TREND

NANTICOKE 1976 – 1988



Hydrocarbons

Ambient hydrocarbons can come from vehicular traffic, seepages at natural gas wells, natural by-products of vegetation, the commercial processing and transportation of refined petroleum products (Texaco) and coking operations (Stelco).

The hydrocarbon monitor measures a large spectrum of individual compounds with varying adverse impacts. Since the mixture of compounds will vary from place to place, it has not been possible to apply a guideline or objective for this parameter.

The instrument separates the hydrocarbons into two fractions-methane and non-methane. The latter are referred to as "reactive" hydrocarbons (RHC) and data for reactive hydrocarbons for three stations are given in Table 6.

The pollution roses in Figure 11 show a minor impact from Texaco at the school site while Stelco's impact on the Nanticoke Village site appears negligible. Levels measured at Simcoe (22071) remote from the industrial zone, were comparable to the school site, but the Simcoe rose in Figure 11 shows uniform concentrations from all directions.

Yearly trends for Simcoe and the school site are given in Figure 12. The decreasing trend of reactive hydrocarbons at the school should be overlooked since data prior to 1984 are believed to be in error due to instrumentation problems. RHC levels have probably remained stable as indicated by the Simcoe curve.

In 1989, the RHC monitoring was terminated, due to weaknesses in this monitoring methodology. The instruments were becoming aged and it was felt replacements would not be worthwhile. In future, hydrocarbon monitoring will be performed with cartridge samples, which while not a continuous monitor, gives a scan of over 100 individual contaminant concentrations.

TABLE 6
NON-METHANE HYDROCARBONS
UNITS - PARTS PER MILLION

			Annual Average	Maximum 1-hour	Maximum 24-hour
22071	Simcoe	1988	.15	0.7	0.3
		1987	.18	0.7	0.3
		1986	.19	0.6	0.3
22904	South Walpole School	1988	.16	1.8	0.7
		1987	.10	1.0	0.3
		1986	.09	1.5	0.4
22907	Nanticoke Village	1988	.10	0.6	0.2
		1987	.13	0.5	0.3
		1986	.11[7]	0.8	0.3

7 - 7 month average (June - December)

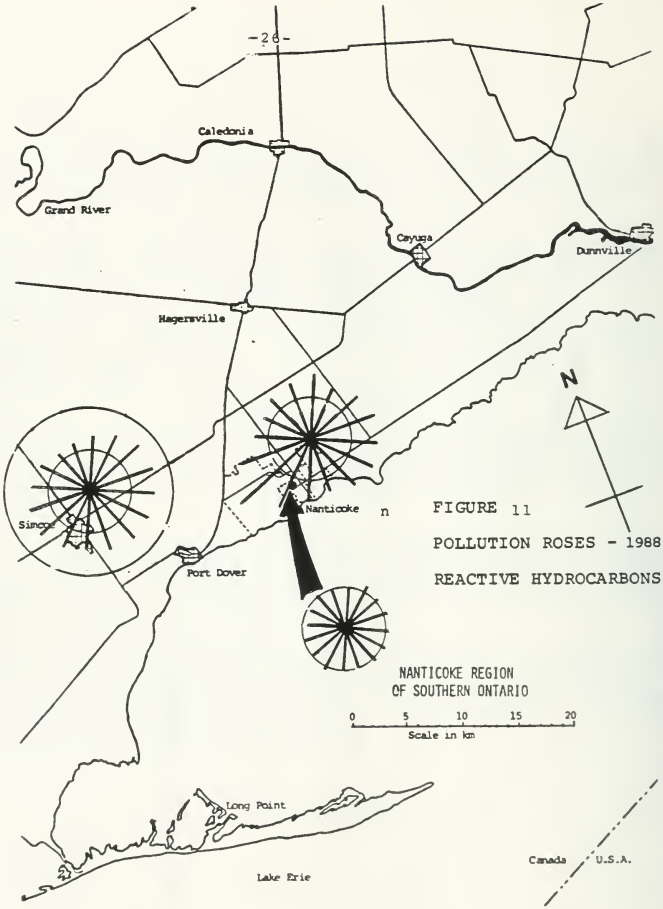


FIGURE 11

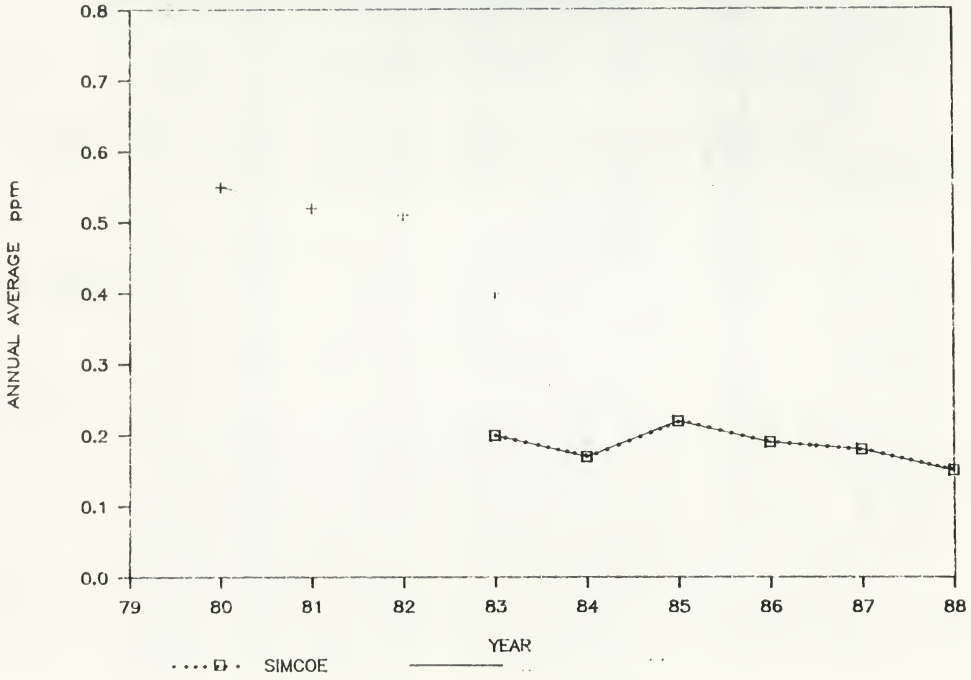
POLLUTION ROSES - 1988

REACTIVE HYDROCARBONS

FIGURE 12

REACTIVE HYDROCARBONS YEARLY TREND

NANTICOKE 1980 – 1988



Ozone

Oxidants are products of photochemical reactions involving oxides of nitrogen, hydrocarbons and sunlight. Ozone (O_3) accounts for most of the oxidants produced, and the sources of the precursor pollutants are mainly industrial and automotive. Ozone is injurious to different types of vegetation including tobacco and tomato crops. The 1-hour objective for ozone (.08 ppm) is based on vegetation effects, but ozone can have adverse human health effects at higher levels.

Ozone concentrations follow very definite annual and daily trends. Highest levels occur during the summer (May to September), and the daily maxima usually occur during mid-afternoon. Both patterns are directly related to temperature and the amount and intensity of sunlight.

Ozone concentrations were measured at two sites and data are summarized in Table 7. In 1988, concentrations were much higher in the summer than previous years. There were 566 exceedences of the hourly objective observed at Long Point and 354 at Simcoe. Elevated levels generally occurred at the same time at both stations during the summer with slightly higher concentrations measured at Long Point during southerly winds indicating that the high concentrations were imported from the United States. There were 65 separate days during the summer in which one or both stations exceeded the hourly objective. The large increase in concentration was largely related to the extreme heat observed in Southern Ontario during the summer.

The pollution roses in Figure 13 only partially confirm that the highest levels occurred under winds from the south and southeast because the relative magnitudes were not that much greater than for other directions. Elevated concentrations do not automatically occur with southerly winds, even during the summer. Specific meteorological conditions are necessary, namely, hot, sunny weather.

The yearly trend graph of hourly exceedences at the two stations in Figure 14 indicates random fluctuations which are probably related to climatological variation. The 1988 levels can be seen to be the highest recorded since the measurements began in 1976.

Ozone, hydrocarbons and oxides of nitrogen can be transported over great distances and can be augmented by local sources. It is generally believed that the ozone problem in Southern Ontario is due to long range transport from the United States and thus will have to be resolved on an international rather than local scale.

TABLE 7
OZONE
UNITS - PARTS PER MILLION Ontario Objective: 1-hour - .08

		Annual Average	Maximum 1-hour	No. of Hours Above Objective
22071 Simcoe	1988	.031	.190	354
	1987	.028	.117	72
	1986	.028	.105	53
22901 Long Point	1988	.038	.189	566
	1987	.032	.132	139
	1986	.031	.124	165

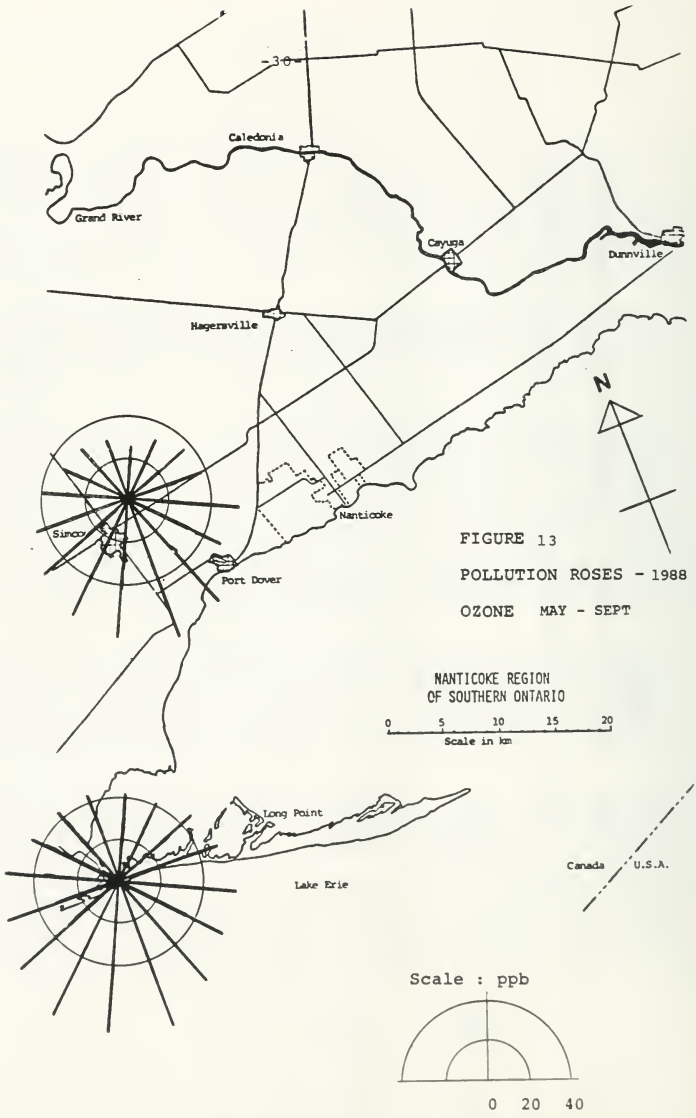


FIGURE 13

POLLUTION ROSES - 1988

OZONE MAY - SEPT

NANTICOKE REGION
OF SOUTHERN ONTARIO

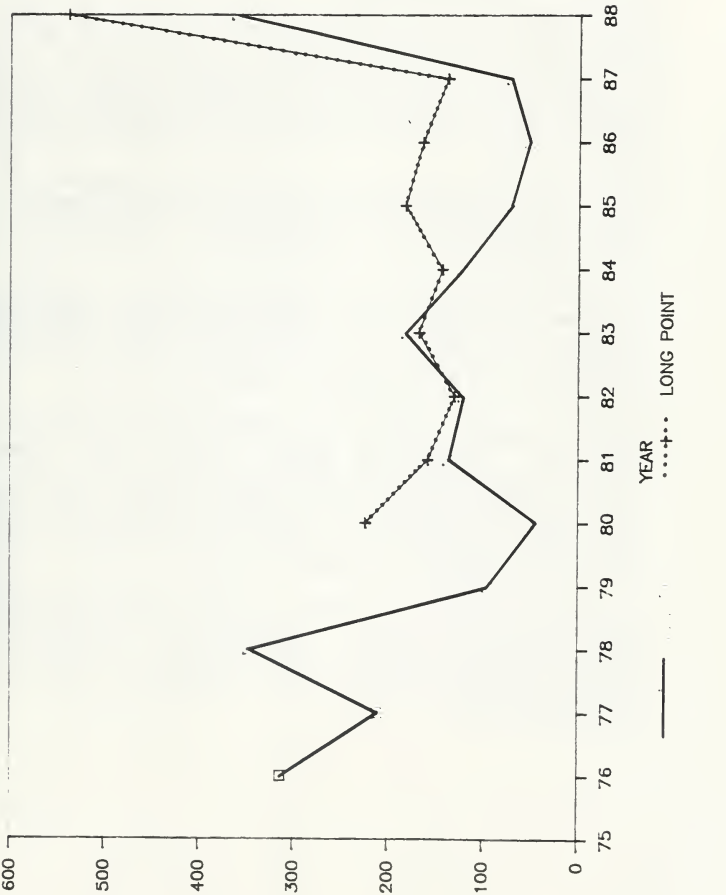
0 5 10 15 20

Scale in km

FIGURE 14

OZONE EXCEEDENCE TREND

HOURS OVER 80 PPB -- NANTICOKE



Total Suspended Particulates

Total suspended particulates (TSP) are measured with high volume samplers which draw a known volume of air through a pre-weighed filter for a 24 hour period (midnight to midnight). The exposed filter is weighed, and the difference (weight of solids on filter) in conjunction with the known air volume sampled is used to calculate a TSP concentration in micrograms per cubic metre. The objective for a 24 hour average is 120 ug/m^3 while the yearly geometric mean objective is 60 ug/m^3. The samplers operate once every six days.

Data from total suspended particulate measurements at eight locations are summarized in Table 8. The daily objective of 120 ug/m^3 was exceeded at three locations, one within the Town of Jarvis and two sites near the Stelco Mill. The yearly objective of 60 ug/m^3 was met at all stations.

The Jarvis station measured one daily objective exceedence which was probably related to local sources, including a nearby baseball diamond. The station in Nanticoke Village (22907) measured five exceedences, likely due to fugitive emissions from Stelco property. A station north of Stelco (22961) measured three exceedences, all during southwest winds from Stelco.

Suspended particulates at at 22092-Rainham/Sandusk near the Ontario Hydro Generating Station, remained low and within objectives. Measures to reduce windblown dust emissions at Ontario Hydro started in 1985 and continued into 1988. The control program appears to have been successful. It involved the recontouring of storage piles at Hydro's flyash disposal site and coal fields. Improved dust suppression equipment and materials were also implemented. The Control Order served to Hydro was completed on schedule in December, 1988.

A total of six hi-vol stations have been operating continuously since 1980 in the Nanticoke area, and the combined yearly trend of these stations is shown in Figure 15. No deterioration is evident. However, levels within Nanticoke Village, close to Stelco operations remain a local concern and trends will be carefully monitored to ensure that particulate levels remain at acceptable levels.

TABLE 8
SUSPENDED PARTICULATES
UNIT - MICROGRAMS PER CUBIC METRE

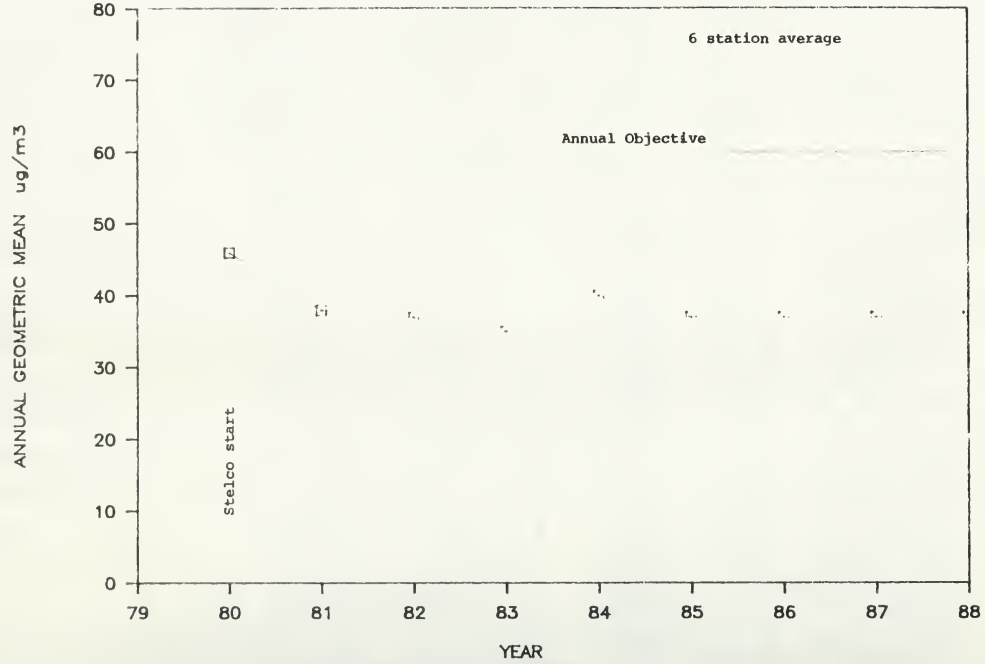
Ontario Objectives:-24-hour-120
1-year geometric mean - 60

	Geometric Mean 1986	1987	1988	Maximum 1988	% of Samples Above 120 (1988)
22087 Jarvis	44	43	47	124	2
22090 Port Dover	30	40	38	120	0
22092 Rainham/Sandusk	71	28	33	120	0
22904 South Walpole School	33	32	28	104	0
22907 Nanticoke Village	62	51	61	234	9
22961 Nanticoke North	42	37	41	165	6
22964 Stelco North	36	32	32	102	0
22965 Dogs Nest/Hwy 6	36	37	35	87	0

FIGURE 15

SUSPENDED PARTICULATE YEARLY TREND

NANTICOKE 1980 – 1988



Dustfall

Dustfall is that material which settles out of the atmosphere by gravity. It is collected in plastic containers during a 30 day exposure time. The collected material is weighed and expressed as a deposition rate of grams/m^2/30 days. The measurement is imprecise and effects are restricted to relatively local areas. Dustfall objectives are based on nuisance effects and are 7.0 grams/m^2/30 days (monthly) and 4.5 grams/m^2/30 days (yearly average). Since dustfall is comprised solely of large particles, it is not a health related parameter.

Dustfall was measured within Nanticoke Village in 1988, (station 22070) and data are given in Table 9. As in previous years, concentrations were low and below the monthly objective in all twelve samples.

The annual trend at this station since 1975 is given in Figure 16. An increase occurred in 1984, and concentrations have since held relatively steady, below the yearly objective.

Two dustfall jars were located near the Ontario Hydro flyash lagoon area. The monthly objective was not exceeded at either 22092 or 22093 which lies closest to the ash lagoon area.

The Control Order referred to earlier was issued to Ontario Hydro in 1985 to reduce windblown flyash emissions. The subsequent control efforts have been successful.

TABLE 9
DUSTFALL
UNITS - GRAMS/ SQ. METRE/30 DAYS

Ontario Objectives 1 month-7.0
1 year avg 4.5

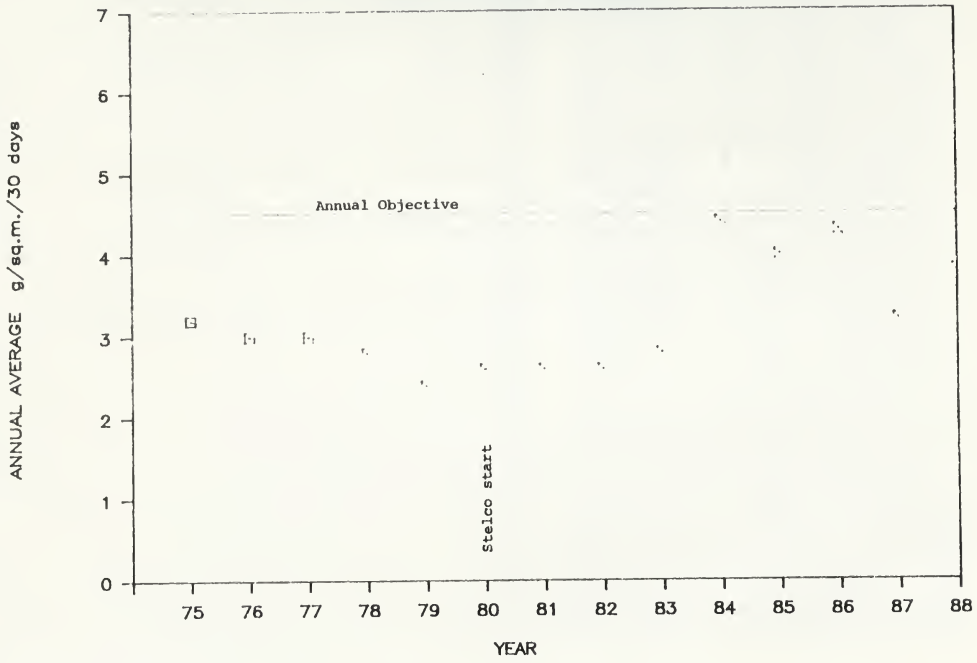
	Annual Average 1986	1987	1988	1988 1-Month Maximum	No. of Months Above Objective 1986	1987	1988
22070 Nanticoke Village	4.3	3.2^{10}	3.8	7.6	0	0	1
22092 Rainham/Sandusk	4.3	2.7	2.2	6.4	1	1	0
22093 N.G.S. Flyash Area	4.8	1.8	2.0	6.7	2	0	0

Exponent refers to number of months when less than 12 valid samples.

FIGURE 16

DUSTFALL YEARLY TREND

22070 – NANTICOKE VILLAGE



Fluoridation

This measurement is a relatively crude assessment used to determine quantities of fluoride compounds in the ambient air. A lime coated paper is exposed to the atmosphere for approximately 30 days and chemically analyzed for fluoride. The fluoride objectives are based on vegetation damage and for this reason, the objective is more stringent during the growing season. For the period April 15 to October 15, it is 40 micrograms/100 cm^2/30 days while for the remainder of the year it is 80. A possible source of this contaminant is Stelco's basic oxygen furnace, although gas scrubbing removes most of the emissions.

Four stations surrounding Stelco property monitored fluoride and 1987 data are given in Table 10.

Concentrations remained low similar to previous years although a trend toward increasing levels is occurring. Two stations recorded one exceedence each of the objectives. Station 22961 is a relatively new site, more downwind of the prevailing southwesterlies (from Stelco), and was established in 1986. It went against the overall trend since its one exceedence was down from four in 1987.

The combined annual trend of the other three stations dating back to 1975 is shown in Figure 17 and indicates the increase in levels in 1987 and 1988.

TABLE 10
FLUORIDATION RATE
UNITS - MICROGRAMS F/100 SQ. CM/30 DAYS

Ontario Objectives: Apr.15 to Oct. 15 - 40
Oct.16 to Apr. 14 - 80

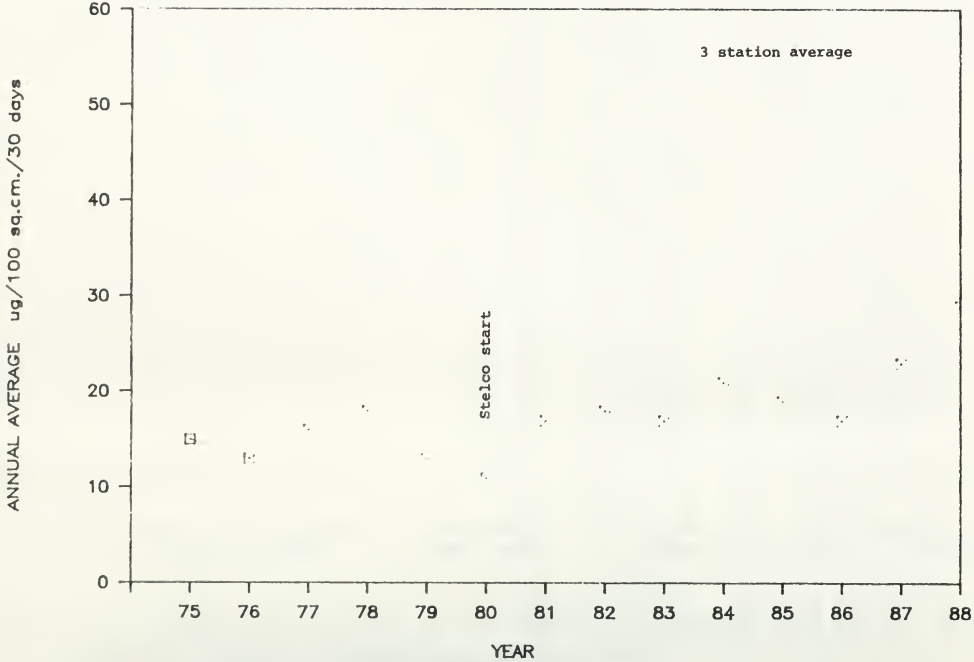
	Annual Average 1986	1987	1988	1988 1-Month Maximum	Number of Months Above Objective 1986	1987	1988
22057 Nanticoke Creek	21	25	32	81	0	0	0
22074 Texaco	18	23	30	64	0	0	1
22083 Dogs Nest	13	20	24	39	0	0	0
22961 Nanticoke North	32[9]	45	42	99	1	4	1

9 - 9 months of sampling (April - December)

FIGURE 17

FLUORIDATION RATE YEARLY TREND

NANTICOKE 1975 – 1988



SUMMARY

Overall, 1988 data in the Nanticoke area revealed that air quality is very good and reflected a relatively minor impact by the main industries. Sulphurous odours near Stelco were the main item of concern.

Pollutants such as sulphur dioxide, oxides of nitrogen, hydrocarbons and particulates showed quite low levels well within relevant objectives.

Total reduced sulphur (TRS) levels and related odour problems within Nanticoke Village continued to be a problem in 1988. Discussions with Stelco have been undertaken and the company will be required to reduce emissions. Studies have indicated that slag quenching is the main source causing the odours.

Sulphur dioxide (SO_2) normally recorded zero or near zero measurements throughout the network of monitors. The Nanticoke Generating Station is the largest SO_2 source in the area but its effect on the Nanticoke area was fairly minor. Only 4 hours out of about 80,000 hours of monitoring exceeded the hourly objective.

Particulate levels in the Region were quite low and generally showed acceptable concentrations. Fugitive dust emissions from the Stelco mill site were still occasionally a problem, particularly under high wind conditions. Close to Ontario Hydro property, distinct improvements in both suspended particulates and dustfall readings have been measured. A Control Order was issued in 1985 to Ontario Hydro to reduce windblown emissions of flyash from the ash lagoon area. The control program to date has been successful.

Fluoride levels around Stelco were generally acceptable, however, two stations did record one exceedence of monthly objectives and there is a general trend toward increasing levels which will have to be closely monitored.

Another pollutant of major concern is ozone, a product of long range transport. Due to an extremely hot summer, record ozone levels were measured in Southern Ontario and appeared to arrive mostly from the United States. Levels measured at Long Point and Simcoe were among the highest recorded in the Province. Oxidant control will be required on an international rather than local scale.